

Design Memorandum

TO: All Design Section Staff
FROM: Bijan Khaleghi
DATE: April 22, 2009
SUBJECT: Curved Precast Girders

This Design Memorandum is to introduce curved precast trapezoidal tub girders with moderate horizontal radius to WSDOT precast prestressed girder bridge inventory.

Curved precast girder bridges could be designed as one piece or in segments depending to the span configurations and shipping limitations. Curved precast tub girders are post-tensioned at the fabrication plants and shipped to the jobsites. Additional on the jobsite post-tensioning may be required if segment assembly is necessary, or if continuity over intermediate piers is desired. In case of spliced curved girders the requirements of July 26, 2006 design memorandum for design and construction of post-tensioned spliced girders are applicable. Precast I-girders may not be used for curved precast girder bridges.

The following limitations shall be considered for curved precast tub girder bridges:

- The overall width of precast curved segments for shipment shall not exceed 16 ft.
- The location of the shipping supports shall be carefully studied so that the precast segment is stable during shipping. The difference in dead load reactions of the shipping supports within the same axle shall not exceed 5%.
- The maximum shipping weight of precast segments may be different depending to the size of precast segments. The shipping weight shall meet the legal axle load limits set by the RCW, but in no case the maximum shipping weight shall exceed 275 kips.
- A minimum web thickness of 10 in. shall be considered for precast tub girders. Other cross-sectional dimensions of WSDOT STD trapezoidal tub girders are applicable to precast curved tub girders.
- The effects of in-plane and out-of-plane forces of curved tendons as prescribed in LRFD article 5.10.4.3 shall be investigated during the design. Adequate web bursting reinforcement shall be considered.
- When tendons curve in two planes, the effects of in-plane and out-of-plane forces shall be added.
- The clear spacing between ducts shall be 2.0 in. min. The duct diameter shall not exceed $4^{1/2}$ in. for curved spliced Tub Girders.

PGSplice program will be upgraded to incorporate the design of precast curved girders.

Background:

Current WSDOT practice for moderately curved prestressed girder bridges is to use straight line precast girders with curved cast-in-place deck slab. With recent improvement in precast girder fabrication and shipping of heavy girders it is now possible to design and build curved precast girder bridges. The above limitations are the result of recent discussions with the precasting and trucking industry for fabrication and shipping of curved precast girders. Until the limitations listed above are verified by actual experience, designers should consult with the precast industry on specific projects where the use of curved precast tub girders is contemplated.

If you have any questions regarding these issues, please contact Bijan Khaleghi at 705-7181.

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